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THE STANDARD-SPECIES OF NYMPHAEA L.

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The appearance of Mr. Kenneth K. Mackenzie's paper on the "Proper Use of the Name Nymphaea" (Rhodora, Nov. 1927, xxix. 234) raises once more a question which seemed to have been finally laid to rest by Conard (Rhodora, July 1916, xviii. 161), namely the correct application of the name *Nymphaea* L. Mr. Mackenzie's case for the application of *Nymphaea* to the yellow waterlilies depends on the acceptance of two points: (1) that Linné in 1753 had a type-species of *Nymphaea* in mind: (2) that it was *Nymphaea lutea* L.

(1) The *type-concept* of genera (and other groups) is now so familiar that its adherents sometimes do not realize or else have forgotten that another concept is not only possible, but was actually held by various eminent botanists during a great part of the eighteenth and nineteenth centuries. This alternative concept of genera, which may be termed the *diagnosis-concept*, is that a genus includes (and the generic name is equally applicable to) all those species that agree with the generic description. No idea of a type-species entered the diagnosis-concept, though species which agreed in all but one or a few of the generic characters might be appended provisionally to the genus as "aberrant" elements. If they were definitely included, however, the generic diagnosis had to be amended.

Acceptance of the diagnosis-concept, combined with inadequacy of the original diagnosis, led in many cases to the transference of a generic name from one group to another which contained none of the original species. This was possible because the sole criterion

for inclusion in the genus was agreement with the description. Thus the names *Epidendrum* L. and *Satyrium* L. came to be applied to (and are still widely used for) genera containing none of the species originally included under them by Linné. Such transferences would not have occurred had those botanists who introduced or first accepted them held the type-concept of genera. The cases of *Banisteria* L. and *Gesneria* L. are similar. The principle governing the application of the generic name in the event of segregation was apparently that it should be applied to the group containing (at the time of segregation) the largest number of species.

It is clear that many of Linné's successors did not hold the type-concept of genera. What evidence is there that Linné himself held it? I know of none.

(2) Mr. Mackenzie states that Linné took up Boerhaave's view that the yellow waterlily was typical of the genus *Nymphaea*, apparently[1] basing this conclusion on the fact that Linné (Gen. Pl. ed. 1, 149) cited Boerhaave, and gave the three elements of the genus in the following order: (1) *Nymphaea* Boerh. (*N. lutea*), (2) *Leuconymphaea* Boerh. (*N. alba*), (3) *Nelumbo* Tourn. (*N. Nelumbo*); and in the generic description mentioned the characters of *N. lutea* before the corresponding ones of *N. alba*. In other words Mr. Mackenzie thinks that "*priority of place*" indicated the Linnean type. I suggest that Linné adopted Boerhaave's sequence as the line of least resistance. Unless he had any special reason to change it, it was obviously less trouble to retain the same sequence.

In this connection it is pertinent to enquire in what order Linné cited the constituent elements of other genera. The first similar case in Gen. Pl. ed. 5 is *Verbena* (p. 12), under which he mentioned the generic components in the following order (1) *Sherardia* V.; (2) *Blairia* H.; (3) *Verbena* V.; (4) *Kempfera* H. The modern equivalents are (1) *Lippia, Stachytarpheta,* etc.; (2) *Priva;* (3) *Verbena;* (4) *Tamonea.* There can be no question that if Linné regarded *any* of the elements of his *Verbena* as typical it was *Verbena* V., which included *V. officinalis* L., the generic type according to modern ideas. Yet *Verbena* V. was only third in order. A possible explanation of this is as follows: the genus included both diandrous and tetrandrous components, and as it was placed in *Diandria*, the groups *Sherardia* and *Blairia* (diandrous) would naturally precede *Verbena* (tetran-

[1] Mr. Mackenzie writes that his argument was not based on priority of position: see postscript.

drous). *Kempfera* (diandrous) may have been placed at the end because it was aberrant as regards its calyx.

The next case in order is *Iris* (Gen. Pl. ed. 5, p. 24) in which the generic constituents are (1) *Xiphium* T.; (2) *Sisyrinchium* T.; (3) *Hermodactylus* T.; (4) *Iris* T. Here the arrangement was based on the morphology of the underground parts: bulb, double bulb, tuberous "root," fleshy creeping "root," respectively; *Iris* T., which includes *I. Pseudacorus*, now regarded as the type-species, came last.

In the case of *Rhus* (p. 129), the order of the constituents is (1) *Rhus* T.; (2) *Toxicodendron;* (3) *Vernix;* the element now recognized as typical coming first in this instance.

Linné (p. 160) united *Alisma* Dill. and *Damasonium* Tourn. under the former name, but mentioned the characters of these genera in the order (1) *Damasonium;* (2) *Alisma.*

The above examples show conclusively that *priority of mention* by Linné of a generic component may be of no value in determining what component, if any, he had chiefly in mind.

Linné's disregard of "priority of position" may be further illustrated by his treatment of species and varieties. In Sp. Pl. ed. 1, 7 he united *Phillyrea folio ligustri* C. Bauh. and *P. angustifolia* (*prima et secunda*) C. Bauh. under the name *P. angustifolia*, making *P. folio ligustri* his var. α (without the symbol), and *P. angustifolia* C. Bauh. his var. β, although according to modern ideas the latter is the "historic type" of *P. angustifolia* L. But in Sp. Pl. ed. 2, 10, where Linné recognized the two varieties as independent species, he retained the name *P. angustifolia* L. for his var. β, and proposed a new name, *P. media* L., for his var. α. Clearly in this case the var. β was—to say the least—just as representative of *P. angustifolia* L. (1753) as the var. α. Why did Linné place *P. folio ligustri* C. B. before *P. angustifolia* C. B.?—apparently because it was the line of least resistance to accept Bauhin's sequence.

The case of *Mesembryanthemum scabrum* L. Sp. Pl. ed. 1, 483, points in the same direction. Linné united *M. purpureum scabrum staminibus expansis* Dill. and *M. purpureum scabrum, staminibus collectis* Dill., as varieties α (without symbol) and β respectively, under the name *M. scabrum*. In Sp. Pl. ed. 2, 692, however, where he recognized the two Dillenian plants as distinct species, he retained the name *M. scabrum* for his var. β. Reference to Dill. Hort. Eltham. 259, 260, shows that Linné, when he (Hort. Cliff. 219) originally

united the two Dillenian species, retained the sequence in which they had been given by Dillenius, again following the line of least resistance.

The example of *M. tortuosum* L. Sp. Pl. ed. 1, 487, is similar, the binary combination being again retained for the var. β. When Linné (Hort. Cliff. 217) originally united the two Dillenian species, however, he reversed the sequence, without any apparent reason, but possibly in order that the variety having the greater number of references should come first.

In the case of *M. loreum* L. Sp. Pl. ed. 1, 486, where Linné—perhaps for the same reason—also departed from the Dillenian sequence, he retained the specific name on segregation for his var. γ, to which it had originally been applied by Dillenius.

Similarly when in 1764 (Sp. Pl. ed. 2, 731, 732) he divided *Ochna Jabotapita* (Sp. Pl. ed. 1, 513) into two species, he retained the name for var. γ, with which *Jabotapita* was originally associated as a vernacular name; and when he divided *Geranium triste* (Sp. Pl. ed. 1, 676) into two species, *G. lobatum* and *G. triste* (Sp. Pl. ed. 2, 950) he reserved the name *triste* for his varieties β and γ, the former being the original *Geranium triste* of Cornuti. These various examples demonstrate that the sequence of varieties in the Species Plantarum, ed. 1, does not necessarily indicate which element, if any, Linné regarded as most representative of the species in question.

To apply "priority of place" in retrospectively typifying a Linnean species, is equivalent to ascribing to Linné in 1753 nomenclatural views held at the present day by a particular body of botanists in the United States.

In the cases of *Phillyrea angustifolia, Mesembryanthemum loreum, Ochna Jabotapita* and *Geranium triste*, when Linné, in Sp. Pl. ed. 2, separated two or more groups which he had previously united under the name of one of them, he retained that name for the group to which it was originally given. How does this principle apply in the case of *Nymphaea?* Linné united *Nymphaea* Tourn. and *Nelumbo* Tourn. under the former name: hence *Nymphaea* Tourn. was presumably the "typical" section. But what was its "typical" element? Tournefort gives no indication. The earliest references cited in L. Sp. Pl. ed. 1, 510, 511, are to *Nymphaea lutea major* C. Bauh. Pinax, 193, and to *N. alba major* C. Bauh. l. c. Caspar Bauhin divided *Nymphaea* into two sections to which he gave the binary names *Nymphaea alba* and *Nymphaea lutea;* but he did not indicate either section as being more representative. The earliest references cited by Bauhin are

to *Nenuphar album* Brunf. and *Nenuphar luteum* Brunf. Brunfels (Herb. i. 38, 40) did not indicate either of these as more representative of *Nymphaea* than the other. Thus from the time of Brunfels to that of Tournefort there is no indication of a "type" of *Nymphaea*.

The previous history of the name *Nymphaea* is immaterial for the following reason: just as nowadays the starting-point for nomenclature is 1753, so for Linné the starting-point both for taxonomy and nomenclature seems to have been Brunfels' Herbarum Vivae Eicones (1530). It may be mentioned, however, that the earliest application of the Greek word νυμφαία was to the yellow waterlily, for which it was used by Theophrastus (Enquiry into Plants, ed. Hort, ii. 466); and that, on the other hand, Dioscorides, who included both kinds of waterlily under *Nymphaea*, called the white kind *Nymphaea*, and the yellow kind *Nymphaea altera*, thus apparently regarding the former as more representative (Dioscorides, Mat. Med., ed. Sprengel, i. 478).

During the period 1530–1720 A.D. the yellow and white waterlilies were regarded as belonging to the same genus. As Mr. Mackenzie points out, Boerhaave (Ind. alt. Pl. Hort. Acad. Lugd.-Bat. i. 281: 1720) restricted *Nymphaea* to the yellow water-lilies, and proposed the new name *Leuconymphaea* for the white. In Syst. Nat. ed. 1 (1735) Linné cited *Leuconymphaea* as a synonym of *Nymphaea*, and in Gen. Pl. ed. 1, (1737) he included *Nelumbo* in the genus.

I do not find any evidence that during the period 1735–1754 Linné considered the question of which was the most typical element of *Nymphaea* Tourn. He not only rejected Boerhaave's division of that genus, but went still further by uniting *Nelumbo* Tourn. with it. Hence the question of the type of *Nymphaea* Tourn. did not arise.

Examination of the description of *Nymphaea* in Gen. Pl. ed. 5, shows that it covered both *N. lutea* and *N. alba*, the words "perianthium pentaphyllum" and "petala calyce minora" referring to the former, while "perianthium tetraphyllum" and "petala germinis lateri insidentia" refer to the latter. Surely the conclusion to be drawn is that Linné in 1754 considered the yellow and white waterlilies equally typical of *Nymphaea*. By 1764, however, his conception of the genus had changed, and the white waterlilies were definitely indicated in the description in Gen. Pl. ed. 6, 264, as the typical element.

I do not for a moment suppose that all adherents of the American Code will be convinced by my facts and arguments, for that would imply abandonment on their part of the principle of "priority of place." The object of my reply is to demonstrate that, starting from the same basis of facts, a very different view as to the type (or absence of type) of *Nymphaea* (1753–54) may be taken, according to the methods adopted in retrospective typification. Until there is general agreement among botanists as to these methods there will necessarily be differences of opinion as to the "type-species" of many of the Linnean genera. And even where botanists follow the same methods they may reach different conclusions: thus in 1922–23 I regarded *Bignonia capreolata* L. as the type-species of *Bignonia* L. whereas Dr. S. F. Blake regarded *B. radicans* L. as the type (*vide* Journ. Bot. 1922, 236, 363; 1923, 191). Here the different results arose from different identifications of certain of Tournefort's figures. Reviewing the case of *Bignonia* L. (1753) in the light of that of *Nymphaea*, I now consider that Linné in 1753 had no particular species of *Bignonia* more in mind than the others. A similar conclusion might be reached in many other cases of Linnean genera. It follows that the only method of securing uniformity in the application of Linnean generic names is the acceptance by an International Congress of a list of Standard-species (vide Kew Bull. 1926, 96). In the case of *Nymphaea*, a suitable standard-species would be *N. alba* L., as that would ensure the retention of the generic name *Nymphaea* as generally applied.

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Postscript. Since the above was written, Mr. Mackenzie, to whom I had sent a copy, has informed me that his "argument about the proper use of *Nymphaea* was not based on priority of position, but was based on the division of the genus into sections by Linnaeus 1737–1753, and his change of generic description in 1764, when he first treated the yellow water lily as differing from the others." In that case, I fail to see that there is any evidence left in support of Mr. Mackenzie's contention. Linné in 1737 did not divide *Nymphaea* into sections or other subdivisions: he merely gave the characters of the three reduced genera, *Nymphaea* Boerh., *Leuconymphaea* Boerh., and *Nelumbo* Tournef. Fortunately the parallel case of

Trifolium shows what Linné really meant. In 1737 he cited five reduced genera with their diagnoses in an "Observation" under *Trifolium*, and in 1742 he added a sixth reduced genus (Gen. Pl. ed. 1, 229; ed. 2, 356; ed. 5, 337). In Species Plantarum, ed. 1, 764, however, he recognized only five subdivisions of *Trifolium*. These were *Meliloti* (corresponding with *Melilotus* Tourn.), *Lotoidea* (comprising, two reduced genera, *Lupinaster* Buxb. and *Trifoliastrum* Mich.), *Lagopoda* (including both *Lagopus* Riv. and *Triphylloides* Pont.), *Vesicaria* (corresponding to none of the reduced genera) and *Lupulina* (corresponding to *Lupulinum* Riv.). Here, where Linné actually published subdivisions of a genus, only two out of five corresponded with individual reduced genera, two other subdivisions each comprised two of the reduced genera, and the fifth corresponded to none of them.

Take another example, that of *Centaurea* L. Gen. Pl. ed. 5, 389. The "Observation" included the names of *eight* reduced genera with their diagnoses, namely, *Calcitrapa*, *Calcitrapoides*, *Rhaponticum*, *Rhaponticoides*, *Amberboi*, *Jacea*, *Cyanus*, *Crocodilium*. In Sp. Pl. ed. 1, 909, Linné recognized only six subdivisions, namely *Jacea*, *Cyani*, *Rhapontica*, *Stoebae*, *Calcitrapae*, *Crocodiloidea*. It should be obvious that reduced genera cited in an "Observation" by Linné with diagnoses were not necessarily regarded by him as sections.

In conclusion I may refer to Mr. Mackenzie's argument that Linné's "account of certain parts of the flower in his description of the genus in the first five editions of the Genera Plantarum *began* with certain phrases applicable only to the yellow water lily" [the italics are mine]. As Conard has pointed out, Linné's description *went on* with certain phrases applicable only to the white water lily. Perhaps I may be pardoned for having assumed that Mr. Mackenzie was here relying on "priority of place" in the description.

CONTRIBUTIONS FROM THE GRAY HERBARIUM OF HARVARD UNIVERSITY,—NO. LXXIX.

(*Continued from page 49.*)

VI. PRIMULA § FARINOSAE IN AMERICA

(Plate 169)

THE genus *Primula*, only slightly represented in America, but one of largest genera in the flora of Eurasia, is notoriously difficult of